DOCUMENT RESUME

ED 255 915 CS 208 784

AUTHOR	Milner, Joseph O., Ed.
TITLE	Micro to Main Frame Computers in English Education.
INSTITUTION	North Carolina English Teachers Association.
PUB DATE	82
NOTE	45p.
AVAILABLE FROM	National Council of Teachers of English, 1111 Kenyon Rd., Urbana, IL 61801 (Stock No. 31565, $2.50 member, $3.00 nonmember).
PUB TYPE	Collected Works - Serials (022) -- Guides - Classroom Use - Guides (For Teachers) (052)
JOURNAL CIT	North Carolina English Teacher; v39 n2 Win 1982
EDRS PRICE	MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	*Computer Assisted Instruction; Computer Literacy; *Computer Software; Elementary Secondary Education; *English Curriculum; *Language Arts; *Microcomputers; Reading Instruction; Sentence Combining; Word Recognition

ABSTRACT

The eight articles in this focused journal issue explore the part computer literacy and computer programed instruction can play in the language arts curriculum. Titles of the articles are (1) "Computers in English Instruction: The Dream And The Reality" (James R. Nicholl); (2) "Computer Uses in the Elementary Grades" (Robert Morgan); (3) "Reading Instruction with Computers" (George Mason); (4) "Applications of Microcomputers to Sentence Combining" (Cyrus F. Smith, Jr); (5) "A Microcomputer Software Program for Word Recognition" (Randall James Ryder); (6) "Computerized Language Arts Instruction in Special Urban Settings" (Bonny Petree and Donna Strother); (7) "The Little Red Electronic Schoolhouse" (Nancy S. Thompson); and (8) "Make Room For Computers in Language Arts" (Shirley Keran). (HOD)

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NORTH CAROLINA ENGLISH TEACHER

Volume XXXIX Winter 1982 Number 2

Micro to Main Frame Computers in English Education

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NORTH CAROLINA ENGLISH TEACHER is published quarterly in Winston-Salem, North Carolina, by the North Carolina English Teachers Association.

Contributors are urged to submit papers dealing with the field of English and the instruction of English at all levels. Manuscripts should be double spaced, typed in acceptable form, and sent to Dr. Joseph O. Milner, editor, NCET, Post Office Box 7266, Wake Forest University, Winston-Salem, North Carolina 27109. Requests for sample copies, remittance for membership, subscriptions, and general correspondence should be addressed to Dr. James R. Nicholl, Executive Secretary, NCETA, Department of English, Western Carolina University, Cullowhee, N. C. 28723

Membership dues, including subscription, are $6.00 1 year, or library rate, $11.00 2 years, $15.00 3 years. Non-member subscribers have the same rate as members.

PREFACE

NCET '81 featured two powerful speakers for the culture who offered English teachers two drastically contrasting visions by which they might shape their own teaching. Robert Coles spoke of days gone by which featured venerable teachers who proclaimed the word and pounded the knuckles of those ruffians who stepped outside the order of their classrooms. His picture of the past enchanted us and made us long for those peaceful school years many of us shared with him. Alvin Toffler spoke of a world to come, his third wave world of the electronic cottage. Electronic individuality was at the heart of his vision. Punctuality, synchronization and docility could no longer stand as the hidden learning of school for these were the essential qualities of the second wave world, not the third.

The need to resolve these antithetical directives was made the more pressing for me when upon returning from Boston I was asked to serve on the North Carolina Curriculum Committee. In reviewing the present shape of that curriculum and considering the form that we ought to give it, the central question which emerged in our early deliberations was that of the breadth or scope of the curriculum and what part computer literacy and computer programmed instruction might play in that curriculum. The present collection of essays stands as a response to those two central questions. Its design is such that it responds in as diverse a fashion as possible. Grade level diversity includes application from early elementary years to the upper levels of the secondary schools. Diversity of student population includes students from the isolated rural community and those of the more fragmented urban setting's optional education center. The mix of content extends from the basics of spelling precision to more sophisticated sentence combining programs. Finally, the mix of system and sophistication of training includes the range from untutored, exploratory, self-made programmer using micro-computers intended for administrative use to well-trained experts working in complex systems of micro and main frame computers.

A final essay surveys this entire gamut of positive responses and evaluates the contribution of computers in terms of the real learnings and the possible limiting features of this electronic approach to education. The total set thus intends to both explore and evaluate the possibilities of the computer-centered school house as way-station on the path to Toffler's electronic cottage. Let us all hope that a knowledgeable professional's support for this new approach to instruction—"computers will minimize interpersonal interaction"—is a false claim and that as promoters of language growth we will find that it maximizes language interaction instead.

COMPUTERS IN ENGLISH INSTRUCTION: THE DREAM AND THE REALITY

James R. Nicholl
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Just imagine--

Dark eyes narrowed to slits, Dawn studies the words on the video screen before her, then confidently types a word and presses the key marked ENTER. Instantly these words appear: "FINE WORK, DAWN! YOU HAVE SUCCESSFULLY COMPLETED THE POST-TEST FOR VOCABULARY ENHANCEMENT, PART C: LATIN ROOTS. YOU CORRECTLY ANSWERED 24 OF 25 QUESTIONS IN JUST 8 MINUTES! YOUR EXCELLENT SCORE WILL BE STORED FOR MR. KLASSEN'S RECORDS. DAWN, PLEASE TYPE D TO STUDY MORE LATIN ROOTS, M TO DISPLAY MORE CHOICES FOR VOCABULARY STUDY, OR Q TO QUIT STUDYING VOCABULARY FOR NOW; REMEMBER TO PRESS THE ENTER KEY AFTER YOUR CHOICE TO GET FURTHER INSTRUCTIONS."

Next to Dawn, Brad is busy taking another post-test. The yellow missile glances off the blue line beneath the word "monster" and disappears; the electronic voice in Brad's earphones coaches: "Remember, Brad, an adjective describes a noun, modifies it. **Monster** is the name of a thing; **monster** is a noun, not an adjective. Look at the sentence again, Brad, and then try your second missile." Brad presses keys to aim again, at the blue line under "angry," and fires. The yellow missile collides with the blue line and both disappear in a cloud of green "smoke," as the word "angry" turns from white to red and the score section of the screen flashes "500," then displays Brad's new total of 6500. "Good shot, Brad. Now let's see you get a thousand points by hitting the adverb in this new sentence with your first missile."

Three miles away, Geoff finishes dialing, listens for the proper signal, and places the phone receiver in a special box by his bed. He scratches under the edges of the cast on his knee as he turns to pick up a keyboard, not much larger and no heavier than his *Warriner's English Grammar* book. Geoff presses some keys and the television screen at the foot of his bed displays the rough draft of his latest theme. He decides that the last sentence of paragraph three should replace the first sentence of paragraph four, presses some more keys, and the text on the screen changes to reflect his revision. After several more changes, Geoff is satisfied and presses some other keys.

On the table beside Mr. Klassen's desk, a typewriter-like machine beeps softly; Mr. Klassen rises, loads a new packet of paper in the machine, then watches as it quickly and quietly prints a cover page, loads another sheet of paper, and begins printing the opening sentences of a paragraph. "Ah, here comes Geoff's essay," Mr. Klassen thinks, as he goes back to his desk, to finish composing the *Macbeth* test for

tomorrow. The screen of his computer terminal displays the various essay questions he has used on the test for the last three years, plus several others he has not yet used. He chooses one of the questions from two years ago, revises the wording a bit, and presses a few keys to store that question. Then he thinks of another question, types it on the screen, and stores it. Noticing that the printer has stopped, Mr. Klassen walks over to the table, gathers the pages of Geoff's essay and puts them in a folder, and turns back to his terminal. He types in a command that, after the students clear the room, will print the completed *Macbeth* test, with the quotation identifications on page one, the matching exercise on page two (these two pages set up to be graded later by the computer), the two essay questions on page three.

Now Mr. Klassen checks today's scores on computer-assisted drill, noticing that Dawn has already completed three vocabulary post-tests, two of them perfectly, but that Brad is still having trouble identifying adjectives and adverbs. He requests and gets from the computer an analysis of Brad's problem, with adjective identification, and starts over to explain adjectives from another perspective. On the way he settles a squabble over use of the newest Apple microcomputer, between two students who both want to work on punctuation; Mr. Klassen puts them to work on a drill-and-practice program he has written, "Dueling Commas," which can accommodate up to four students.

That's a small sample of The Dream. There are more students, of course, thirty or so per class (even in a dream!), all in the classroom except Geoff. Each is often working at his or her own pace, frequently learning material more rapidly because English is interesting, even fun, and seldom a waste of time. Besides, Mr. Klassen seems not only to understand each student's strengths and weaknesses but to have time to help and to praise.

If The Dream had gone on, we might also have noticed Mary Trangh, getting help with the English idioms that differ so from her native Cambodian, or James, whose work with various tutorial and drill activities is helping reduce the interference of Black dialect with his writing in Standard English, or Emily, using a program called "Bard," which helps her learn more about poetry while creating it. We might also have stayed after school, and watched as Mr. Klassen easily made further revisions to his *Macbeth* test, brought his gradebook up to date electronically, and did a rapid computer-assisted key-word search of *English Journal*, *North Carolina English Teacher*, and twenty other journals, to find articles with different ideas for teaching "The Lottery" and "Flight."

Such a dream is packed with good news for English teachers, of course. Ideally, the computer would easily and flexibly respond to the individual differences in knowledge levels and learning speed that exist in every class. Thus our language arts classes, where we introduce so

many new concepts, would become more pleasant for everyone, and not just because the children learned more quickly and fully, but also because we could give them more personal attention, especially those needing our help most. In later grades (even into the first college year), English teachers would no longer have to march an entire class in lock step through spelling tests for everyone because half the class cannot spell, or through sentence completion and combining exercises for everyone because a third of the class cannot seem to write a paragraph without a sentence fragment or a comma splice, or through twenty homework sentences for everyone because five students still have not learned when to use question marks. "Busy work" for students and tedious clerical tasks for teachers would virtually disappear.

Now consider The Reality--

Computers **are** here, in numbers that are increasing almost exponentially. In the 1980-81 school year, perhaps 200,000 microcomputers or computer terminals were being used for teaching in American public schools, at over 13,000 secondary schools and over 9500 elementary schools (North Carolina, Minnesota, California, and Texas are among the leaders in this trend); by 1985, as many as one million computers will be in American schools (*Educational Technology*, 21 [March 1981], p. 8; *Creative Computing*, 7 [Oct. 1981], p. 6). The hopes and dreams for computer-assisted instruction (CAI) that flourished in the 1960's and died in the early 1970's have been revived and embellished by the introduction since 1975 of microcomputers, which are relatively cheap, self-contained, expandable, full of promise. We are, it seems, in the early stages of a change in information manipulation and delivery which can best be compared to the introduction of printing from movable type in the 15th century; a powerful new tool is here, but few of us can use the computer now, just as few could read five hundred years ago. Then two hundred years passed before use of textbooks became common; now we already see school applications of computers at all levels, although much less often in English than in mathematics and science. Even so, every part of The Dream described earlier either does now exist, at least in crude form, or could exist.

So what are the constraints that keep The Dream from becoming totally real? There are eight major inhibiting factors.

Probably the foremost is the inherent conservatism of education. Most teachers tend to change their instructional methods slowly and reluctantly, if at all, and they are often abetted in their resistance to change by administrators, school boards, governments, and the general populace. Tacitly encouraging this stasis are textbook publishers. Their desire to retain or obtain a share of the lucrative educational market causes them to stay with the crowd rather than to try new ventures, as anyone who has ever wandered from booth to booth at a textbook publishing exhibit has quickly noticed. However, the herd psychology of publishers is now taking a new direction, as they begin to hedge their

bets by adding "courseware" (instructional programs for computers) to their offerings. In fact, here are some names from a recent list of publishers actively seeking or publishing courseware: Hayden, Houghton Mifflin, McGraw-Hill, Merrill, Milliken, Random House, SRA, and Scott, Foresman (*Classroom Computer News*, 1 [July/Aug. 1981], p. 37). Clearly such other major publishers as Harcourt Brace Jovanovich, Harper and Row, Heath, and Macmillan may soon feel the need to join this herd, if they have not already done so.

The second restraint is obvious: money. All too often we can hardly teach because of shortages of everything from books to chalk. And while just a few years ago we could at least have hoped to purchase or lease the equipment necessary to start our versions of The Dream, now budget restraints and cuts at every level of funding make that hope fade, even though equipment prices continue to ease in the face of competition as such aggressive companies as Atari, Burroughs, IBM, and Xerox enter the educational computer marketplace.

A related check on The Dream, beyond its price, is the limited capability of current "hardware" (the computer itself, along with such associated peripheral devices as printers and disk drives). These limitations are temporary and technical, often based on cost, but they cannot be ignored; current computers and peripheral devices are not as we would wish them: printers are too noisy for use in crowded classrooms, disk drives and computer memories cannot store all the data we have or retrieve it as readily as we would like, and so forth.

A fourth restriction grows out of the preceding one. Even the best current hardware can be unreliable, especially at inopportune times (just like the projector that refuses to thread while the class goes berserk and we tear our hair in frustration). A personal example: Like Geoff in The Dream, I had planned to compose and revise this essay on my home computer, using an excellent word-processing program; but my printer was in the repair shop and when I picked it up, it merely raised false hopes and wasted my time before I had to return it for more repairs. Consequently this essay was written in longhand, typed in a rough draft, and final typed—a familiar, tedious reality.

The fifth curb on The Dream is English teachers' general lack of interest in and knowledge of computers and their associated technology. Part of that ignorance stems from our natures, more often oriented to the verbal and the aesthetic than to the technical and scientific, more comfortable with the printed page than with the video screen. In addition, the money restraint, coupled with our workloads, hinders personal attempts to become knowledgeable through appropriate courses and workshops.

Another restriction is our lack of knowledge about how people, especially children, **really** learn, and thus how best to teach them. We now admit this deficiency, and much has been done to alleviate it, yet we have only just begun. One example, quite relevant to The Dream, is so-called "learner feedback." Some researchers contend that reinforcing learning through immediate praise for each accomplishment significantly improves the quality and pace of learning, while others assert that

constant or frequent immediate reward may retard, not improve, learning. Since one strength of the computer is its ability to provide speed of light feedback (see the examples of Dawn and Brad in The Dream), we clearly need to determine how best to use not only that ability, but others, such as graphics, repetition, branching (leapfrogging) forward or back to other sections of an exercise, and the like.

However, even if we had good knowledge of how people learn, there is the seventh restraint: the inherent complexity of English as a field of study, whether as language, literature, composition, or in some combination. Again, we have at least acknowledged our ignorance and many are hard at work reducing it (we think of William Labov, Northrop Frye, Janet Emig, Linda Flower, James Brittin, and others). But right now we are mostly surveying the base of the mountain; a few are gauging its slopes; none have glimpsed its peak. (The computer, properly used, can both hasten and ease our efforts in this area.) Until we understand much more about how everything, especially English, is best learned and taught, we will find it difficult to achieve The Dream.

Suppose, though, that in quest of The Dream we accept our limited knowledge of learning, and that we overcome or neutralize the other restrictions listed above (we force ourselves to learn a little about computers, get funds and buy a microcomputer, set it up and get it running, etc.). Then we discover one more obstacle between us and even a part of The Dream: Courseware is scarce for English and language arts, far from the abundance of textbooks and other printed materials. Beyond that scarcity, any existing program that we find may have one or all of these faults: (1) It will not work on our computer (programs are written not just in languages, but in dialects of languages and for specific machines; a program written in the BASIC programming language for a TRS-80 Model III will not run on an Apple, Atari, or Pet, or even on a TRS-80 Model II— and vice-versa for all of these machines); (2) It costs too much (some word-processing programs cost over $300; SRA offers a fine series of nine phonics programs, for the Atari only, at $150 per program—or $1,150 for the full series); (3) It is written on the wrong level for our class (instructions and/or exercises may be incomprehensible to our third graders, or seem childish to our teenagers); (4) It contains factual errors (I have seen phrases labelled as clauses and verbals incorrectly identified); (5) It is pedagogically unsound (a few of many possible examples: allowing the student to move quickly through a program just by guessing repeatedly, with no added tutoring by the program after wrong answers; encouraging the student to give wrong answers—one of the first "educational" games, "Hangman," does this; ambiguous multiple choice questions, with more than one possible correct answer but only one that the program will accept as correct); (6) It does not quite fit our class's needs and cannot be modified by the teacher to do so; (7) It fails to take advantage of the computer's capabilities, being little more than an electronic workbook; (8) Its instructions are so complicated that students cannot follow them or so verbose that students lose interest before they begin or finish the exercises; (9) Its response times are too long, so that students' interest

wanders or disappears (one effect of working at a computer terminal is a relative change in time comprehension; computers normally react so quickly that a clock second soon begins to seem lengthy, and waiting ten or fifteen seconds seems an eternity); (10) It lacks proper distributor or publisher support, especially adequate documentation (the "owner's guide"—written material which should accompany the program disk or cassette, explaining how to load the program for use in the computer, how backup copies may be made—if at all, how to use the program most effectively, what problems may arise and how to solve them, who to contact if something goes wrong, and so forth).

Beyond the scarcity of suitable courseware, here are a few more obstacles to reaching The Dream; these may loom large or small: teachers' fears that they will be replaced by computers (the computer is yet undreamt of that can replace a halfway competent English teacher); worries about what happens after the new toy has been in the room a few weeks or months (every school closet contains at least one "Teaching Aid of the Future," gathering dust and cobwebs); worries about damage, vandalism, and theft (various optional electronic circuit boards for the Apple microcomputer, costing $100-300, can easily be broken by probing fingers or slipped out of an unsecured case and into a pocket); worries about injuries (when plugged in, even if turned off, some inner parts of computers and their peripherals can deliver an electric shock if touched). Happily, there are practical, often simple, solutions to these worries, although it is easy to see that The Dream of computers in the English classroom has the potential to become a nightmare.

In any case, The Dream is on its way, accelerating even, and nothing that we do or fail to do will stop it (some may consider smashing computer terminals, as futile now as burning books was centuries past). But due to the the hindrances discussed above, The Dream will not arrive next year, or the year after, and probably no earlier than the 1990's. That is just as well, for most of us are ill-prepared for the changes that are preceding and will accompany its arrival; we all know how difficult it is to attain our dreams. Yet have you ever known an English teacher who was not a dreamer? Without our dreams we would never have finished that first week in the classroom, nor stayed there, week after week. And, after all, The Dream built upon computers in our classrooms is only a part of THE DREAM: that glorious day when each of us, and every one of our students, come gladly to school, they gladly to learn, we gladly to teach.

COMPUTER USES IN THE ELEMENTARY GRADES

Robert Morgan
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The cathode ray tube, the heart of television sets, video games, and computer displays, acts as both friend and foe. English language instructors have long expressed concern over the impact of commercial and cable television, and more recently over the profusion of arcade type video games, but the phosphorescent glow of the computer screen, with a little debunking of mythology, should be viewed as a friend indeed and not as another complex technological diversion from the printed word. For both teachers and children, the removal of a lot of mythology and just plain false information helps make clear the role of the microcomputer (or personal computer, or microprocessor) as a really useful tool. Teachers should view the new small computers not as some mystical instrument of the technocrats or math teachers, but as a useful teaching tool for most educational goals. Indeed the new micro-computers are far more useful to English teachers than for math teachers simply because the microcomputer relies on the English language for its operation. The new microcomputers work much more effectively as word processors than as calculators. In fact, except for complex mathematical functions, the microcomputer is really quite cumbersome as a calculator.

There is nothing overly complicated about microcomputers. Almost anyone can quickly learn to operate and program them in a relatively short time. Programming can even be self-taught, at least at a level sufficient to find many creative uses for the microcomputer in the teaching of English. Even if one hasn't the time or inclination to learn programming, there are plenty of high school students whose ability to program, whose imagination and interest provide plenty of talent for preparing programs to use in the teaching of English at the elementary level. Find an interested and talented high school programmer and explain what you would like to teach using the microcomputer. Suggest any creative or personalized touches you would like in the program and see what can be produced.

Elementary students have a wide variety of misinformation about microcomputers. They confuse calculators, Atari and other video games, and microcomputers. A brief introduction to the various elements of a computer and a little experience with even the simplest program will quickly eliminate most of this confusion. Many students (as well as a significant portion of the population at large) believe that a computer has all the answers to all the questions built into the machine. A little work on the concept that computers **know** only what they are told and **do** only as they are instructed is in order. A few students will expect a computer like the one on board the "Enterprise" in the film "Star Trek" — a computer which talks and really does seem to contain all human knowledge.

The possibilities for utilizing the microcomputer in elementary English

education are as varied as the imagination of the user. Most of the traditional skills can be taught well using the computer. Some skills were practically made to be taught by computer. Spelling is a fine example. One program which works well for developing sight word spelling ability operates in the following manner: The computer is given a list of words which the student is expected to learn to spell. The student sits at the keyboard and the screen displays the first of the words on the list. After a few seconds the word disappears and the screen asks the student to spell the word. If he spells the word correctly the computer congratulates him and then displays the next word on the list. If he spells the word incorrectly, the computer indicates that he made an error and shows him the word again. There are an infinite number of variations to this spelling program. The microcomputer could show the word in a misspelled form, for example, and ask the student to correct the word. The programmer can add any desirable variation.

Programs designed to increase vocabulary level are a natural for the microcomputer. Programs range from simple "choose the letter of the correct definition" types to more sophisticated programs which ask the student to choose an appropriate word to fit a context identified by a blank spot on the screen.

Using the computer in the teaching of reading provides a variety of possibilities. A simple program which simply displays the words of a story on the screen is sometimes effective with otherwise reluctant readers. The reader simply pushes any button on the keyboard when he has finished reading what is on the screen and wants the next part of the story. The computer can also be used to personalize stories. Before a story is flashed on the screen, the student types in his name, his city, his teacher's name, or any other information which might be used to personalize a story. As the story progresses, the computer will automatically integrate the personal information into appropriate places in the story. Hence, the student himself becomes the hero of the story and other information unique to that student becomes part of the fabric of the story. The possibilities here are endless and are limited only by the imagination of the teacher.

Grammar and writing can also be taught by using the microcomputer. In fact, much work with sentence combining and transformational grammar has already been done with the microcomputer. Excellent practice in the development of more sophisticated sentences can be had using the microcomputer. Since the microcomputer has the capability of working as a text editor, the range of its uses in teaching writing is wide. The computer can show in animated fashion when to use "WELL" and when to use "good", it can vividly depict the correction of a run-on sentence or a fragment, or it can actively and visually demonstrate almost any sentence structure problem and its correction.

Children who use the computer may need some experience with a keyboard before they actively use the computer. They don't need to learn touch-typing, but they will profit from a little familiarity with letter positions. Programs can be designed, however, which require no keyboard experience. Such programs are most useful with younger

children. The computer asks the student to "Push any button" or the teacher tells the student to push any button whenever he sees a star displayed on the screen. Working with letters on a keyboard has obvious value for beginning or poor elementary students, anyway. Some young students who are experiencing difficulty with letter or word recognition improve greatly when confronted with the excitement that a computer keyboard can generate.

The key to astounding success in the use of the computer is the creative and imaginative ability of the teacher-programmer. Even programs dealing with learning material by rote can be made exciting depending on how imaginative the teacher-programmer can be or how well the teacher-programmer can personalize the program for the students who will be using it.

Elementary English teachers who wish to use microcomputers but are unable to find time or talent to program have literally thousands of commercially available programs to choose from, many of them well thought out and clever. Two disadvantages to commercial programs are that they may not fit exactly the individual needs of a particular learning group and programs will not be personalized. Several source books which list and describe commercially made programs are available. One very complete one is available from "Classroom Computer News," 51 Spring Street, Watertown, MA 02172.

Beyond the expected and the "ordinary" are some very extended uses of the computer in elementary English instruction. With a little planning and a sophisticated programmer, the micro-computer can be used as an aid to developing creative writing ability. It can be programmed to contrast two pieces of writing, one without vivid adjectives, the other rich with description. It might ask the student to enrich a dry passage of writing, or it might ask a student to develop similes or metaphors after giving some examples and then arrange those student-generated metaphors into some meaningful pattern. In fact, the microcomputer can be programmed to "write" poetry by asking students for key words, phrases, and similes and then displaying those words, phrases and similes in a pre-programmed pattern. More sophisticated programs can actually analyze poetry or prose by acknowledging key words or phrases given by students in answer to directed questions.

The micro-computer is ideal for developing simulated situations or simulated games. One such program puts the student in the place of Alice in *Through The Looking Glass*. As the student responds to questions about Alice's journey, the computer responds by describing situations and even drawing maps and pictures. Questions like "what should Alice do now?" or "What did Alice do next?" provide experience in thinking about literature and even about values as expressed in literature.

Many "games", some quite mindless and silly, are available for microcomputers and teachers will want to be sure that students see the total possibilities of the computer and not view it as an electronic game room. The game concept serves the teacher well however and games which serve the educational goals can readily be designed or purchased for the microcomputer. Most of the popular classroom word or spelling

games can be programmed for microcomputers.

The future is a veritable gold mine where teachers will find an expanding range of new ideas and technologies from which to plunder. Possibilities include the rapid teaching of material which can be learned by rote. Some have even suggested that the grammar and punctuation rules that seem endless to occupy English programs could be taught thoroughly and effectively in the space of several weeks. The implication is that sight word vocabulary, spelling, and other "basics" could be taught more effectively and considerably more rapidly than is currently possible.

Computers that talk already exist. They "talk" because a special voice modulator is programmed to say what the programmer wants it to say and when. This ability to "talk" will increase in sophistication very quickly. The possibilities of a programmable talking computer are endless in elementary education — from speech rehabilitation to storytelling to conversational skills. The microcomputer, because it is programmable, is much more versatile than the hand-held electronic learning aids (as valuable as they are) such as "Speak and Spell" and "Speak and Math."

We have yet to see the final stage in the development of the micro-microcomputer—one which has all of the capabilities of the full size microcomputer but can be held in the hand. Quick developments in this area will overcome some of the current limitations of the pocket microcomputer (limited memory and small display area, for example).

The microcomputer may not be the elementary English teacher's panacea. Properly understood, it is much more than a toy, much less than a technological nightmare, and a most useful device in the toolbox of English educators. We may decry "Space Invaders" and other blacksheep of the cathode ray family, but microcomputers are friends, not foes.

READING INSTRUCTION WITH COMPUTERS

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Both the influence and the impact of the computer on our society are increasing at an accelerating rate. As *Mechanix Illustrated* (1981) reported in the "Education" section of its special issue on computers, "If 1980 was the year computers swept small business, then 1981 is the year they take the classroom by storm" (p. 46). And indeed, 1981 was a year in which large numbers of schools purchased computers and began to use them not only for administration purposes, but also for instruction. Many, but not a large percentage used their computers for reading instruction.

The instructional uses of computers are limited by the availability of the computers themselves, the availability of the software (the programs which are loaded into the computer through tapes, disks, or the computer's typewriter—like keyboard), and the teacher's knowledge of ways to use the programs available. This essay will address the third of these limitations by listing some of the major uses of computers in reading instruction and citing a few examples of software programs which are both available commercially and appropriate to the major use explained. In most cases I will specify the kind of computer required for executing a program named. However, if the particular brand of computer available to the reader is not named, it is not necessarily the case that no useable version of the program exists. Generally, after a program for some one brand of computer has been on the market for a few months, versions which will run on other computers become available. The software market is extremely competitive and many computer users enjoy translating a program so that it can be run by another computer (often their own).

Skills Instruction

A great deal of the software designed to improve reading performance is programmed drill-and-practice intended to improve particular reading skills. The Computer Curriculum Company offers a number of skills — based programs which run on their own CCC-17 computer. Control Data Corporation offers their **Basic Skills Learning System** which runs only on their own computerized Plato Education System. Houghton-Mifflin's Time Share Company offers its **STRIDE** programs which run only on its Dolphin computers and two companies, Centurion Industries and Tiger Electronics make computers with programs built in. These cannot be modified by the teacher, nor can software for them be purchased. Extensive studies of the effectiveness of these programs and systems have been conducted and for many children and undereducated adults these drill-and-practice programs have value.

In these programs, a few formats predominate. In one format, an incomplete sentence appears on the screen with three or four words or phrases to choose from. The student chooses a word to fill the blank and then is reinforced (if the answer is correct) or told to try again. A second

format often used is the tachistoscopic presentation of a word followed by a request to spell it. A third format involves a graphic (often cartoon-like) display and a choice among words or phrases, one of which describes or in some way fits the picture. In some of the recently-developed programs, the computer actually talks to the pupil, saying things like "Say it!" "Spell it!" "Nice going." or "Find the word that rhymes with fat." The child responds by reading or inspecting the screen and then by typing a number, letter, or word on the screen. Almost never is the response more than a word and seldom is reading fluency or comprehension of long complex passages one of the goals. However, some of the most recent programs involve combining the testing and reinforcing capabilities of the computer with the obvious superiority of the **BOOK** as a device for displaying long printed passages. Several companies are now marketing programs in which the benefits of the book and the computer are combined. These have great promise. Computers can (1) pronounce words as soon as the student types them, (2) show pictures and graphs which change with student input and increase understanding, and (3) assess student progress **in reading books!**

Skills development programs are also available for the microcomputers which are most common in American schools. Scott-Foresman markets reading modules for the Texas Instruments-99/4 (TI-99/4) computer and Random House markets programs for Radio Shack's TRS-80. Science Research Associates has a series of phonics programs for the Atari-800, and Scholastic markets reading skills programs for the Apple-II computer as well as for the TI-99/4 and the TRS-80. The formats employed for the available skills lessons are much like those cited above. The computer screen becomes an electronic workbook page (in programmed learning style) and the computer gives instant feedback to the student while also keeping score for the teacher. Such programs are becoming quite well-known.

Conversational Programs

A small, but increasing, number of programs interact with students as if the two were carrying on a conversation. The best known of these, *ELIZA*, available on cassette tape for the TRS-80 from Radio Shack, starts by displaying *"WHAT IS YOUR PROBLEM?"* If the student then types, "I hate you!", the computer will respond, "We're talking about you, not me," or "How long have you felt this way?" Many middle school children enjoy hours of conversation with *ELIZA* (which will respond to any typed statement and will actually talk, if the computer is equipped with a speech synthesizer). The student must **type**, however. He therefore gets **both** reading and writing practice.

For those who can afford the time to type a program into their microcomputers, ABECEDARIAN might be fun. Williams (1981) describes how he created the program and lists it (in its entirety) so that others may enter it in their own computers and try it out at no cost to themselves. When the program is run, the computer asks the student to type in some names (of people), some subjects, some verbs, etc. Then it begins a gossip sort of conversation which can go on for some time.

Story Builders — Story Starters

There are a number of story builder programs. These rely on the computer's ability to make a random selection from a group of words, phrases or sentences. One such program, named (appropriately enough) STORY BUILDER (available from Scholastic on cassette tape for the 16K TRS-80, Apple II, and Atari computers) will create zany sentences to illustrate for young children the roles played by the various parts of speech.

Another program, also named STORY BUILDER (available from Random House) for the TRS-80 computer has been designed to teach syntax and the relationships of story components by providing a "mix and match" storybook format so that students can experiment with sentence structure and create new (and often hilarious) story structures.

For the teacher who can arrange to have a student type a program into the computer, the ALIEN DESCRIPTION PROGRAM should be fun. Roberts (1980), a science fiction writer, developed this program to help him with the attributes of the aliens in his stories. The program, which is printed in its entirety in Roberts' article can generate a lot of character descriptions leading to creative writing and, of course, to the reading of what has been written.

STORY STARTER is a program available from Random House for the TRS-80 microcomputer. It provides elementary level students with practice in constructing cause-effect and time sequence stories. There are three difficulty levels with ten opening lines per level. The student, of course, types in the rest after reading the first line.

Poetry Writing provides five specific ideas for a poem to be completed by middle school and secondary students. This cassette program for the TRS-80 computer, available from Scholastic, allows the student to choose a general idea and then provides a first line for a poem on that idea. The student enters the second line. The computer enters the third, the student the fourth, the computer fifth, and the student the sixth (final) line. Although the program is designed to elicit writing, it requires careful reading.

Interactive Fiction

A very new type of computer program is the short story or novel in which the plot is partially controlled by the reader. Liddil (1981) criticizes *"Six Micro Stories"* a program (by Scott Adams) which is available in disk form for the TRS-80 from Adventure International. He complains that "there are only a couple of ways each story can be played" and that the vocabulary is smaller than that in the "adventure games" (to be described later).

These deficiencies are less limiting in even newer interactive fiction of a more ambitious sort. At least five long interactive fiction works, called compu-novels, are now available from Adventure International and from The Software Exchange (TSE) in the form of disks for the TRS-80. Just imagine, next fall you may receive two book reports on the same book — with quite different plots! Many students will read these interactive works of fiction several times (each slightly different) before tiring of

them, although some will stop when they have accomplished a "happy ending."

Games

Nearly all computer games require some reading, even if it's only the directions to put a quarter in a slot. However, many of these games are designed to teach reading skills. For example, *ALPINE SKIER*, available on disk for the TRS-80 and the Apple II computer from Data-Command, shows a human figure (the student) skiing down a slope and meeting a gate. In order to clear the gate the student must decide whether a short passage on the screen is a cause or an effect, or whether it is a fact or an opinion. Right choices keep the skier moving downhill and wrong choices bring on a wipe-out.

Other games for which there are a great many programs include the spelling-guessing game that once was called hangman or hangman's noose (there are several variations available), tic-tac-toe, concentration, cryptograms, scrabble, and target shooting games. In all of these, screen graphics are used for either motivation, context, reinforcement, or for combinations of these three variables. Powers (1981) discusses his computerized version of PERQUACKEY and lists the program so that interested educators can type it into their own computers and use it to stimulate vocabulary improvement among their students. (It's much like Scrabble with time limits.)

Another type of game, called "Adventures," consists almost entirely of reading and writing. One which may take the novice several weeks to solve is *RAAKA-TU*, available in cassette for the TRS-80 computer from Radio Shack. Some others which are considered to be excellent are *THE COUNT, VOODOO CASTLE*, and *PIRATE ADVENTURE*, all available from Creative Computing Software, most in either disk or cassette for three or four of the most common microcomputers. In these programs the student "is" an adventurer confronted with a difficult task. In order to accomplish it, he types directions such as "Go north," or "Pick up sword," or "Light candle with lamp." Depending upon the instructions given, the adventuring student may be lost, wounded, imprisoned, or killed (in which event he will have to start over again). The material to be read is not difficult, and it will be read and re-read several times. Adventure games seem to be a valuable addition to our high-interest, low vocabulary reading materials for less able readers in the senior high school.

Pre-reading and Reading Readiness

Many educational software companies distribute very simple programs for young children. *ALPHABET KEYBOARD*, by Betamax and available in cassette for the TRS-80 from Random House, teaches kindergarten and first grade children to find letters on the keyboard and (eventually) to type them in alphabetical order. The beginning segments of *LANGUAGE ARTS SEQUENCES*, available in disk for the Apple II computer from Milliken Publishing, provide practice in letter recognition. Kimmel (1981) describes and criticizes the programs tried by his pre-school son. He

strongly endorses some of *NINE GAMES FOR PRESCHOOLERS*, available in cassette for the TRS-80 computer from TSE, and *DANCING DEMON*, also in cassette for the TRS-80 from Radio Shack. Among the games are *REPEAT*, in which any letter typed by the child is repeated 32 times on the screen. *LETTER WARS* is a small-letter lesson with a brief space battle ensuing after every ten letters appear. If you get the letters right, you win. *NAMES* requires an adult to type in six names which are then repeated on the screen in random order until the screen is filled. At that point, adult and child pick out (point and name) words on the screen. The Touch-and-Tell computer from Texas Instruments seems also to have the potential for excellent readiness and early reading activities.

Teacher-produced Software

Many of the better computerized educational programs contain a provision that allows the teacher to add words, passages and questions, and/or to receive from the computer a report on the child's work. For beginners in classroom computerized reading instruction such programs seem to be an appropriate way to get started.

However, for the reading teacher with time and initiative, programming one's own lessons is almost unavoidable as soon as a computer becomes easily accessible. Part of the reason for this is that the software available is often programmatically sound but not educationally sound. For example, few teachers want the beeps and whirrs of electronic sound coming from more than one corner of the room, especially when one or another of the children or groups in the room is taking a test. Sometimes the software is boring, just as some texts are boring. And sometimes the print is too difficult for the reader, just as books are sometimes too difficult for many of our students. Finally, available programs often don't match the instructional systems in use in particular schools.

Consequently, the reading teacher who develops software should follow some rules. Jelden (1981) lists seventeen guidelines for software development. These are "must" reading for the teacher-programmer. Buyers should also be aware of what constitutes good software. Kansky, Heck, and Johnson (1981) point out a number of problems in software selection and list guidelines for deciding upon purchasing. Meyer (1981) states twenty-one questions to answer before buying reading software. By answering these questions and following the guidelines, educators can assure themselves that their programs can be successful. However, just as with any other kind of instructional program, the best test of a computerized reading program is a tryout by students.

Student-produced Programs

At recent conferences of the National Council of Teachers of English (NCTE) and of the International Reading Association (IRA) microcomputers were a much-discussed topic. At the latter a special-interest group on "Microcomputers and Reading" met. Several of those attending had developed reading software. However, a few of the participants maintained that allowing their children **to learn to program** and to enter

printed programs into the computer was perhaps the best way to teach reading. Students who get involved in programming are reluctant to get up and leave the machine until their programs have run successfully. They will read the manual, proof-read their program listing, and request spelling — just to show their mastery over the computer. And some of the programs produced by students may actually be useful in helping other students develop or practice reading skills. This application doubles the benefits of the student's learning. It may well be that one of the most productive methods of teaching reading to the children of the future will involve helping them learn to program a computer.

Summary

The reader may have encountered in this essay a number of publishers whose names are unfamiliar and whose addresses are unknown. A partial list of addresses is printed in *Mechanix Illustrated* (January, 1981 — a special issue devoted to computers) and most of the others can be found on the pages of any issue of *Croative Computing*. Although a number of organizations attempt to evaluate educational software, and computer magazines frequently feature critical articles on software, educational software is very infrequently included. Consequently, the best sources of reading software evaluations are the educational computing journals such as *T.H.E. Journal, The Computing Teacher, School Microware,* and *Electronic Education.* Selective reading of journals such as these and tryouts of programs with appropriate students should lead to the addition of a number of computer programs to the reading teacher's "bag of tricks."

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APPLICATIONS OF MICROCOMPUTERS TO SENTENCE COMBINING

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During the summer of 1980, I embarked on a project to determine the suitability of microcomputers for sentence combining instruction. I knew from my former experience as a high school English teacher that students engaged in composition instruction enjoyed sentence combining. I also knew that adolescents either owned or had access to hand-held calculators, home video games, and the endless variety of coin operated computer games found in amusement arcades. Since adolescents found pleasure in both of these activities, yet for different reasons, it seemed reasonable to determine if sentence combining programs could be developed for microcomputers and if such programs would be practical for composition instruction.

A major concern was to maintain student interest without compromising a salient feature of sentence combining. In the application of sentence combining instruction, students do not study about writing but are directly engaged in writing. This feature is especially important and I was not interested in developing programs which would reduce or eliminate the expectation that students write. I was particularly wary of developing programs that would allow students to respond to sentence combining problems via a multiple-choice format. I was aware of such programs in other curricular areas and, in many instances, I found them wanting. One objection to these programs was that students had at least a 25 percent chance to guess the correct answer. A second objection was that multiple-choice formats would eliminate the provision for student writing and allow them to passively respond to someone else's writing. Unfortunately, a multiple-choice program format would have been relatively easy to program, primarily because the program can be written to limit the choices from which the student can pick. When programming a standard sentence combining problem, all possible sentence combinations have to be anticipated and included. If this is not done, a student would be penalized for being imaginative or creative. An anticipated problem stemmed directly from this inherent characteristic of sentence combining; i.e., many problems result in a large number of syntactically and semantically correct solutions. Specifically, would a microcomputer have a large enough memory to accommodate a myriad of possible combinations?

Because of the magnitude of this concern, I decided to utilize the language that offered the largest memory capacity for the Apple II microcomputer. Since the capacity of the Apple II can be increased from 48K to 64K by inserting a language board, PASCAL was used to achieve this boost.

PASCAL is based upon "if, then, until" logic. Certain conditions are specified. "If" these conditions are met "then" something happens. "If" these conditions are not met "then" something else happens "until" they are met. In a sentence combining program, "if" a student combines a set of sentences appropriately "then" an affirmative response appears,

followed by another pair of sentences. "If" the set of sentences is combined inappropriately, "then" a negative response appears, followed by the original sentence set. This sequence occurs "until" the sentences are appropriately combined. Let me illustrate this by referring to one of the initial programs that was developed. (You are invited to program your Apple so as to see it more vividly.) A program entitled *"Sentcomb"* follows:

```
PROGRAM SENTCOMB;
VAR SENTENCE: STRING
BEGIN
    WRITELN ('Look carefully at the');
    WRITELN ('following sentences.');
    WRITELN ('Your task is to combine');
    WRITELN ('them. Remember to end');
    WRITELN ('your combined sentence');
    WRITELN ('with a punctuation mark.');
    WRITELN;
    WRITELN ('The rocket landed.');
    WRITELN ('It landed on the moon.');
    REPEAT
            BEGIN
            READLN (SENTENCE);
            END;
            IF SENTENCE<>'The rocket landed on the moon.' THEN
            BEGIN
            WRITELN ('You made an error, try');
            WRITELN ('again.'); END;
            UNTIL SENTENCE = 'The rocket landed on the moon.';
            WRITELN ('Very good. You have');
            WRITELN ('responded correctly.')
        END.
```

If you are unfamiliar with interpreting a computer program, what would appear on your viewing screen would be the words in parentheses which follow the "WRITELN" statements. This includes the initial directions, the two sentences for combining, and either the negative or the affirmative response. The nature of the response is determined by the sentence combination that is typed into the computer.

Even though this is a relatively simple program, several limitations are present. While most of these are attributed to mechanical or grammatical errors, there is one limitation of major importance. The mechanical errors include those associated with spelling and typing. The grammatical errors are those of capitalization and punctuation. If any words are misspelled or if any typing errors are committed, the negative response will appear. It is important to note that the more often that keys are pushed, the greater the opportunity there is for mechanical errors. Similarly, if the first word in the sentence is not capitalized or if the combined sentence ends with anything but a period, the negative response will appear. While these limitations are noteworthy, the failure to program all of the possible syntactically and semantically correct combinations of the original sentence set is paramount. Indeed, any

response other than "The rocket landed on the moon" is considered to be incorrect.

When one considers the programming difficulties related to these issues, it is easier to rationalize the attractiveness of multiple-choice response formats. A multiple choice response format is attractive for at least three reasons. 1) It is relatively easy to program; 2) It would significantly reduce the opportunity for mechanical errors; and, 3) All possible sentence combinations would not have to be accounted for. Regardless of the attractiveness of a multiple-choice response programming format, one thing should be kept in mind. That is, the most salient feature of the sentence combining curriculum — the provision for actual student writing — would be eliminated. Students would be selecting sentence combinations rather than creating them.

I am happy to report that many of the limitations previously discussed have been either partially or completely overcome. Part of this resolve came from improved programming, part came from a field test, and part came from a re-examination of the use of microcomputers for sentence combining. All of these were accomplished through modifications made to the program prototype that was included earlier.

The most significant of these changes focused on a way to limit the amount of memory required by the many possible solutions to a sentence combining problem. This was accomplished in two ways. First, each problem set was limited to two sentences. Second, each lesson focused on only one task. These tasks either addressed word order within a sentence or a specific sentence-embedding-transformation. The former required students to determine if a group of words comprised a sentence or to reposition a string of words in random order so as to form a sentence. In the latter, students were presented with a set of sentences and directed to combine them using a pre-determined sentence-embedding-transformation, i.e., a relative clause modifying an object, a relative clause reduced to a past participle, the coordination of a noun phrase and a verb phrase, etc. In essence, all sentence-embedding-transformations can be accommodated in the master program that was developed and, at the same time, the possible solutions to a sentence combining problem can be reduced to a manageable number. This master program is similar in format to the prototype presented earlier. However, it is much more complex and sophisticated.

A typical sentence combining lesson would proceed as follows: First, students read a set of directions and examine a sample of the type of combination they will practice. Next, they proceed through the lesson, combining a set of two sentences into one. If the set is combined appropriately, the student receives a positive reinforcement followed by the next set of sentences. If the set is combined inappropriately, the student receives a negative reinforcement followed by the original set. When the set is combined appropriately, the lesson sequence continues. At the end of the lesson, a printer is activated and the student receives a worksheet of additional sentences that are to be combined using the same construction. After certain lessons, the worksheet includes a larger set of sentences that can be combined using several sentence-embedding-transformations.

Currently, I am still at work refining the master program that I have developed. As of this writing, it is not finished to my satisfaction but it has evolved dramatically from my initial attempts. At this point, I feel confident in stating that sentence combining programs can be developed for use with microcomputers. A question that remains though is, "Are such programs practical for composition instruction?"

As with any curricular issue, advantages and disadvantages can be advanced for the use of microcomputers in composition instruction. Advantages include motivation, reduction in pupil teacher ratios, and the provision of direct student interface with contemporary technology. The merits of these advantages are obvious. However, disadvantages should also be considered. The most prevalent disadvantage is an economic one. In order to equip an entire classroom with microcomputers, a significant capital expenditure is required. Critics of this position assert that not every student need have access to a unit. Indeed, one or two microcomputers might be found in a building or a classroom. In instances such as this, one needs to consider the amount of computer on time alloted to each student, whether or not it is a sufficient amount, and the type of instruction provided, i.e., remedial, developmental or advanced.

Another consideration concerns the purchase of software. Specifically, should commercially available software be bought or should in house software be developed? Earlier I raised objections to the multiple choice format of some lessons presented on microcomputers. Before investing in a system, a district should examine the software for that system in terms of its curricular soundness, its usability, and its format. Much of the software currently available is long on recreational diversion and short on educational importance. In addition, some microcomputers are not compatible with software marketed by other publishers. Further, some microcomputers cannot be programmed. This further bonds the purchaser to the manufacturer. Investing in non-programmable units is less expensive but will not allow for the development of in-house instructional software.

Finally, those individuals responsible for determining if microcomputers are to be used in the English curriculum should consider one fundamental issue. Specifically, could the same tasks performed on a microcomputer be done equally well with paper and pencil? Earlier, I mentioned that I had field tested many of the sentence combining lessons that I have developed. In these tests, I observed that students, as a group, enjoyed the lessons, did not make unnecessary or wholesale typing or spelling errors, and seemed to learn from them. A fact that remains, however, is that I observed similar reactions when I taught sentence combining lessons in the traditional way. I have also noted positive student reactions when observing other teachers provide similar instruction. These observations have not dissuaded me from pursuing additional refinements on my master program or of developing different programs. They have given me an interesting perspective, however, on the value and potential of such endeavors. I urge other educators who are engaged in similar pursuits not to lose sight of or to dismiss the many successes that result with traditional composition instruction.

A MICROCOMPUTER SOFTWARE PROGRAM FOR WORD RECOGNITION

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Word recognition instruction has traditionally been the mainstay of beginning reading programs. Typically, this instruction involves the presentation of phonic rules which purport to provide the reader with clues to the pronunciation of words already incorporated into the student's listening and speaking vocabularies. While there is strong evidence to suggest that phonics instruction is useful with beginning readers (Chall, 1967; Bond & Dykstra, 1967), its appropriateness for secondary remedial readers has recently been questioned (Hill, 1978; Ryder, 1980). Essentially there are two reasons for the unacceptability of phonics for secondary students. First, most secondary remedial students have been exposed to incessant phonic instruction for many years to little avail. Alternate strategies would thus serve as a motivation to the students. Secondly, phonic rules themselves are relatively useless in their ability to accurately and consistently predict letter-to-sound relationships (Clymer, 1963). Furthermore, it has been demonstrated that secondary remedial readers have a relatively high degree of mastery of all but the most variant letter-sound correspondences (Ryder & Graves, 1980). Recognizing the importance of word identification in the process of reading, and the need for instructional approaches to more appropriately meet the needs and abilities of secondary remedial readers, this author began writing a microcomputer software program to facilitate the acquisition of word recognition skills. What follows is a rationale for this software's development, a description of the software itself and, finally, a statement of the strengths and shortcomings of the software.

Software Development

Practical and effective applications of computer assisted instruction (CAI) in reading must be initiated under the assumption that CAI can provide a stronger pedagogical delivery system than that currently available in published form. In reviewing published materials which purport to teach word recognition skills for secondary students, one is immediately struck by (1) their limited scope and sequence, (2) their limited breadth of instruction, and (3) their failure to potentially captivate the motivation of the learner. In recognition of these deficiencies, an instructional delivery system was created to incorporate sound pedagogical principles which made use of the recursive instructional potential of the microcomputer, and which attempted to be more than the "workbook on computer" software currently available on the market.

As mentioned previously, most commonly used word recognition materials display a limited scope and sequence of instruction. Perusal of one of the most commonly used secondary reading materials, for example, indicated a scope and sequence beginning with highly variant correspondences (i.e., ea → /i/, heat) which provided only one possible pronunciation of the vowel cluster being taught (heat). Such instruction

not only ignores the other pronunciations of ea (bread, earn), but it also fails to teach the student that the rule ea → /i/ (heat) cannot be distinguished on the basis of letter environments. Consequently, one would surmise that continued use of rules which fail to account for alternate pronunciation would produce little success in their ability to teach students word recognition skills. Another difficulty with contemporary word recognition programs is their assumption that all students should receive instruction on all the letter-sound relationships presented in the program regardless of the individual student's particular mastery with those correspondences. CAI can overcome this problem quite readily by presenting students with lessons that match their individual deficiencies. In recognition of the current state of word recognition materials, the development of this instructional software was based upon (1) letter-sound correspondences which have been shown to more accurately exemplify the nature of English orthography than that found in most contemporary materials, (2) letter-sound correspondences which secondary remedial readers have failed to fully internalize (Ryder & Graves, 1980), and (3) techniques which have been shown to be useful with secondary remedial readers (Cunningham, 1980). Correspondences presented in the instructional program were obtained from Venezky's (1967) analysis of the orthographical patterns appearing in the 20,000 most common printed words. As a result of this lengthly investigation, Venezky suggested that spelling-to-sound correspondences be classified into the following three categories:

1. Invariant-Predictable (b → /b/, z → /z/)
2. Variant-Unpredictable (ea → /i/, /e/, /e/)
3. Variant-Predictable (c → /s/ before e, i, or y,
   otherwise c → /k/).

In an attempt to determine the correspondences identified by Venezky which were not fully mastered by secondary students (Ryder & Graves, 1980) it was found that variant-unpredictable vowels and vowel clusters have not been fully mastered by secondary students. Consequently, each of the 51 variant-unpredictable vowel and vowel cluster correspondences identified by Venezky were selected for use in the software. The sequence of instruction proceeded from the most frequently occurring correspondences (i → /e/ impress) to the more infrequently occuring correspondences (ea → /i/ease).

To increase the breadth of instruction beyond that of contemporary word recognition materials, a variety of routines were incorporated into the computer program. One rather unique feature of this program is the use of an audio cassette which provides the user with directed verbal instruction intermittently throughout the lesson. To accomplish the interface of a cassette recorder with the microcomputer, a relay was built which is plugged into the game I/O of the microcomputer. Using sequential access to the tape, "Peek" programming commands in the master program activate the relay which is connected to the remote jack of a cassette recorder. The recorder plays for the duration of time

indicated by the program, then is again shut off via the "Peek" command.

Another attempt to increase the breadth of the instructional program was the inclusion of a two-staged instructional program. In the first stage students were presented highly frequent monosyllabic words displaying a certain letter-sound correspondence. After a series of instructional steps involving words exemplifying the given correspondences, students ultimately proceed to a second stage of the program involving relatively infrequent polysyllabic words again displaying the letter-sound correspondences being presented. This two-staged format was devised under the assumption that students must internalize correspondences to the point where highly frequent words displaying these correspondences are responded to automatically. Once mastered, these highly frequent words can then be used as "analogues" in decoding polysyllabic words exemplifying that correspondence. For example, a student having difficulty pronouncing the word **metamorphic** would be likely to provide its pronunciation if the analogues **met a more tick** were provided in conjunction with the polysyllabic word presented.

Finally, in developing the word recognition software, it was determined that the microcomputer provides an ideal mechanism for the delivery of motivational devices to gain students' academic engaged time. Consequently, a variety of games, musical melodies, personalized feedback statements, personalized story text, and graphics routines were written. These were devised with the understanding that they were not instructional in themselves, but maintained the student's interest in the various aspects of the program.

The Software Program

The software consists of 51 lessons contained on 16 sector diskettes. The programs are written in Integer BASIC. The hardware required for these lessons includes an Apple II plus microcomputer, an IDS 440 printer with parallel interface, two Apple disk drives, an audio cassette recorder with a remote input jack, and the author-designed relay which is placed in the game I/0.

The program begins by the student selecting a lesson from the program "menu." Following the selection of the program, the student is requested to type in his/her name followed by the selection of the date. This information is used to maintain a user record file on the second disc drive. For any particular lesson, the teacher is thereby provided with a permanent student record diskette indicating the lesson attempted, the date the lesson was attempted, an item analysis of the student's lesson performance, and a percentage of total items correct. The input of the student's name also allows further instructions and feedback statements to thereafter include that particular student's name. The lesson begins by the screen presentation of eight monosyllabic words simultaneously. Six of the eight words display the correspondence being presented in the lesson, while the other two words display other correspondences. These two distracter words were inserted to maximize the likelihood that the student's attention would be directed to a procedure whereby dissimilar orthographic environments would be compared to the orthographic

environment of the correspondence presented. The presentation of those words is then accompanied by the activation of the cassette which voices one of the eight words, then shuts off. The student then types the word pronounced and presses the return key. If the student's response is correct, an uplifting musical melody is played. If the response is incorrect, a low-pitched tone sounds and the student is instructed to "try harder next time." In either circumstance, these messages are then followed by the sole presentation of the word on the screen and the cassette's voicing of the correct word. This procedure is followed for each of the six words exemplifying the given correspondence.

The next aspect of the program again makes use of the six previously presented words. For each word a sentence incorporating that word is constructed, although the word is deleted. As each sentence is presented on the screen, the cassette is activated and the word-deleted sentence read to the student. The six words exemplifying the given correspondence are listed under the sentence and the student types the correct response. At this point in the lesson the motivational graphics routines are randomly generated for respective correct or incorrect responses. If, for example, a student responds correctly, a cartoon character will appear on the screen holding a large sign saying, "Fantastic" or "Super response." If a student chooses an incorrect response, a graphic display is given such as a flashing "Whoops" engulfing the entire screen. This display is then followed by directions to select another response. When the correct response is finally chosen, the cassette is again activated and the complete sentence is read. To prevent students from simply typing words from the list in the order they occur under the sentence, alternatives are randomly generated for each presentation. Moreover, if students misspell a word, the program will, by visual display, direct their attention to the error and request another attempt. Upon completion of the sentences, each of the words is first pronounced via the cassette, then flashed on the screen for 1/4 second. The student then responds by typing a "Yes" or "No" to indicate if the word flashed was identical to the word pronounced. Again, motivational graphics and musical melodies are interspersed throughout this instructional sequence. The initial stage of the word recognition program is completed by a print-out of a one to two page high interest, low vocabulary story displaying deletions for the words presented in the lesson. Where feasible, the stories are personalized by incorporating the name which the user inputs at the program's initiation. The print-out itself is removed from the printer and completed as a seatwork activity.

The second stage of the word recognition program is the analogue instruction previously mentioned. Again the student begins the instructional sequence by choosing the appropriate lesson, inputing his/her name and the date. Once the lesson is selected, the student is provided with brief audio instructions from the cassette and the lesson begins. Initially, a polysyllabic word exemplifying the correspondence being presented is displayed on the screen with a stress mark indicating the accented syllable. The audio cassette is then activated via the program and the polysyllabic word is pronounced twice. The word

remains on the screen and four possible analogue combinations of the word appear below the polysyllabic word. For example, if the word to be analogized is incasement, the following would appear on the screen:

incase'ment

(1) in base' sent

(2) in bad' sense

(3) in bar' sense

(4) in air' sense

The student then selects the appropriate response by indicating one of the four numbers. If an incorrect response is selected, the student is given an unmelodic tone and instructed to attempt another response. Upon completing the correct response the screen displays the correct analogue. Each of the three distracters is then presented separately. The user then underlines the surrounding letters which are distinct from those displayed in the correct analogue. Using the example above —

in base sent (screen image of correct analogue)

"Underline the letter or letters in the word with quotation marks, those letters, which make it sound different from the word **base**."

(cassette tape)

in "bar" sense (screen image)

The student, using the underline key on the keyboard, indicates which letter or letters gives the vowel a different sound. If the student incorrectly identifies the letter or letters, he/she is provided with the correct answer by the cassette recorder as is the student correctly identifying the letter or letters. Finally, the instructional sequence is completed with the presentation of several games such as hangman using the words displayed in the lesson.

Strengths and Shortcomings

The word recognition software has to date been piloted to a limited extent with remedial students attending the University of Wisconsin-Milwaukee Reading Clinic. Tentative observations suggest that the students demonstrate little difficulty adjusting to the sequence of instruction, and can respond to the demands of the program quite readily. Their ability to adeptly adjust to computer instruction was swift and positive. Most noticeable was their motivation to engage in the lessons, and their ability to maintain a high degree of academic attention to the lessons. The use of audio instruction appears to be especially facilitative for the students. Unfortunately, the programs have not been field tested to the extent that measureable improvements in word recognition abilities can be quantified.

It can also be noted that the pilot studies have demonstrated several shortcomings to this particular program. Most noticeable was the

program's implicit approach to teaching letter-sound correspondences. Several students, while performing quite well on the lessons themselves, did not understand the objectives of the lesson. Future program modifications will therefore include direct explanation of the correspondence presented. Another shortcoming of the present program which is not readily adaptable to modification, is the limited capability of the audio cassette. At present, all information recorded on cassette is activated by sequential access; that is, all information on the cassette must be presented in the order of its occurrence on the tape. A more versatile instructional routine could be possible with random access (any message on the cassette could be retrieved at any time regardless of its location on the cassette). For example, if random access were available, each student response could be evaluated on the basis of its degree of correctness, then a cassette message provided for additional information depending upon the student's response. Apparently several computer companies are currently designing hardware systems to provide random access to audio cassettes and one can anticipate their availability within a year.

The instructional program described here was designed with relatively limited resources and few curriculum specialists. Hopefully, as teachers become aware of programs such as the one described here, publishers will commit themselves to large scale financial investments which ultimately will offer teachers sound instructional software at relatively low cost.

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COMPUTERIZED LANGUAGE ARTS INSTRUCTION IN SPECIAL URBAN SETTINGS

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Because we are new to the field of computerized instruction, we have been extremely impressed by the opportunities we see for its use in the field of language arts. This is particularly true in the special situation in which we have observed their effectiveness. The Optional Education Center (OEC) is a school for students who, for one reason or another, are unable to adjust to a traditional school setting. Because at OEC, students are allowed to work at their own rate, the computer is an extremely effective instructional tool. It not only allows more time for the teachers to provide individualized instruction but it teaches our students important language skills. We will confine our discussion of computers in language arts instruction, then, to their particular effectiveness with the special kind of student we encounter in an optional educational setting.

There are various reasons why our students are at OEC. Many of them cannot handle the standard hours of a regular school because of the need to work to support their families; many are parents-to-be that require special time off for medical appointments. These conditions make it impossible for them to keep up in a traditional school; therefore, the flexible hours of OEC (8 a.m. — 7 p.m. weekly) and the fact that students are working at their own pace suit their needs. James, for example, is a typical student at OEC. James comes from a family of six; his father is an alcoholic and demands that James helps support the family. Because he is preoccupied with family problems, James has generally been uninterested in school work and has been labeled a troublemaker. Although we realize that situations like James' exist everywhere, OEC is unique in that almost all of the students come from similar backgrounds; at OEC they are all out of the mainstream.

Many of the females at OEC are mothers or mothers-to-be and have already accepted that sizeable responsibility in life. Thus, to come to school and be forced to submit to the authority of the teachers and principal causes resentment. At home they are adults; at school they are treated much like children. This is where the effectiveness of computers enters into the picture. When placed at the computer, these students come alive. They come alive because they become responsible by taking an active part in their own learning process. For example, a computer does not tell our students when to do their work; instead, the students are in charge of what program the computer will present to them. The computer only reacts to what the students do, and this interaction gives the students a feeling of responsibility, control, and equality with their mechanistic "teacher". The most encouraging part of this interaction is that our students learn by doing, and they learn with enthusiasm.

Another important aspect of the computer, regarding adolescents' endangered ego, is its neutrality. It does not play favorites or bring any previously determined expectations to its interaction with students.

Since many of our students feel that they lost out because of or were penalized by these expectations, this aspect of the computer holds great appeal for them. The computer is totally objective; the threat of judgement is thus not present. Whereas this could seem to be a disadvantage for some students because of the lack of human emotion, for our students it is often a relief to escape the low-level expectations they have encountered in the classroom.

Another aspect of the computer that appeals to our students is that it allows them to avoid the public embarrassment of negative responses. The students we work with at OEC often come in with extreme reluctance to answer any questions for fear of being wrong. Although we realize that every student has a fear of incorrect answers, we are dealing with students who have experienced failure so often in the schools, that they have come to expect it. Not only is this discouraging, it is embarrassing for them. Our students rely heavily, as most adolescents do, on peer approval. It is essential to be "cool", to gain their friends' approval if not admiration. Thus, any negative remark by the teacher can be very threatening to the students. The computer avoids this public verbal correction, and thus allows the adolescent to avoid embarrassment and in the long run may save the teacher from an angry retort. It is the programmer who determines how the computer will react to an incorrect response and the very response style can have an impact. Whereas some programs use a question mark or funny picture when students offer incorrect answers, others simply write in the correct response and move on. We have found the latter to be the most effective method because in addition to letting a student know the correct answer, it eliminates the possibility of anyone glancing over the student's shoulder and knowing that an answer was incorrect.

Another advantage of computer instruction is that the student does not "fail", he simply keeps trying. The teacher may not be able to find the time to keep repeating the same problems with a particular student, and continuous dittoes may become boring. A computer, however, frees the teacher from this necessary activity as well as holding the student's attention. Although we realize that repetitive drilling is seen as a questionable method for learning language skills, we have seen that this computer drilling is effective with our students. The instant response of the computer which allows the students to know immediately if they are right or wrong is also reinforcing because it eliminates the discouragement of waiting to get back the graded papers. Moreover, students' motivation can be undercut when they receive a seemingly less objective negative grade.

The more we began to realize the advantages of the computer for our students, the more excited we became. We also realized that we were not alone in our enthusiasm. At this point we became very curious about how and why computers were brought into OEC. Ron Mehlen, a relative novice in the field of computers, does all of the computer programming at OEC. Many of the ideas for programs come from different teachers, but Ron does all of the actual programming of the computers. It was Ron's initial curiosity which eventually led OEC to place such emphasis

on using computers in teaching. In the Spring of 1980, OEC received two computers which were hooked up with a prescription learning system. This system provided feedback on skills inventory tests given to students. The master computer, after receiving the data from the inventory tests, was designed to send back a readout which contained a list of the skills which students have as well as a list of the skills in which the students need improvement. But as this system was ideally set up to be used in a learning lab with groups of students, it was not particularly suited to the individual instruction of OEC. Therefore, the computers were used very little for quite some time.

Because these neglected computers were in the competency and remediation division within close proximity to Ron's area, curiosity began to draw him to these computers. He had never had the opportunity to "play" on one before, and the more he played the more fascinated he became. He soon decided that he wanted to learn how to program the computers.

The instruction manual, while suitable as a refresher for a more experienced programmer, left Ron confused. Fortunately, he located a couple of comprehensible books on the market which taught the basics of programming. The following Fall he completed two courses on programming computers which were similar to the one at OEC. Finally, he found a more advanced book for programming which added more complex skills to his programming repertoire.

After Ron learned to program, he saw that these computers could be used in many areas of education. At this time OEC picked up half a dozen more computers as well as a computer printout. They were becoming hot items, both with the students and the teachers. By the Fall of 1981 the number had reached ten, and they were being used in various subject areas.

Ron has found that when using a computer to aid in teaching, there is a sequence which is generally followed. First of all, the students take a skills inventory test which measures the skill needed for a particular unit. Then this data is entered into the computer, and it immediately offers feedback as to what level the students are currently on as well as a listing of skills the students have and do not have. By using this process, Ron believes that we are much more able to treat students as individuals.

The next step in this sequence involves the teacher. The teacher must locate the materials appropriate for the students' level. It is at this point that the students learn the basic concepts needed and then it is back to the computer to refine and reinforce this knowledge.

Through these computer programs, the students gain a real mastery of these skills. We have seen this to work well with a large percentage of our students. The students clearly learn by doing. A good computer program will adjust to what the students know, going back to a less complex level if the students make successive mistakes or moving on to a more difficult level if the students have mastered the earlier material. This is where the individual interaction with the computer comes into play. Each student can drill at his own rate until he reaches his own particular proficiency level.

The particular skills taught by the computer that we have observed include increased proficiency in the areas of vocabulary, usage, analytical thinking, writing skills, and even in more subtle reading skills. The computer helps students with vocabulary problems in numerous ways. Spelling, for instance, can be improved through tactics as simple as a game called Hangman. This game is set up with the motivational factor known as racing the computer. At the bottom of the screen is a train representing the computer, and a train representing the student. With each correct response, the students' train moves forward, and with each incorrect response, the computer train moves forward. The result is an indirect method of encouraging better spelling skills. In order to beat the computer the student must learn to spell words correctly. Thus, what seems to be just a game is actually a very effective mode of teaching. In reading literature students often encounter unfamiliar words. Computer programs can be designed to help familiarize the student with this vocabulary. Definitions can be taught by using multiple choice and having a student select the correct definition. Another variation of this method involves the teaching of connotations. This program lists several correct definitions of the same word among which the student is asked to choose the most appropriate for a given sentence. In order to succeed in this drill the student must be aware of the context clues. Being able to utilize context clues is very useful in developing comprehension skills.

A final way of improving vocabulary is through various game tapes. The most popular among our students are the adventure tapes. The adventure game tape presents a dungeon and dragon type situation where students choose what they will do. For example, the computer reads out that "you have entered a cairn: will you 1) enter, 2) avoid it?". Obviously the students must know what a cairn is before they make any important decisions. The exciting factor is that students will ask because they want to win. In the process of trying to beat the computer, the students improve their vocabulary. We also have several other computer programs that help our kids with trouble spots in vocabulary. For example, many of our students have trouble with homonyms and other similar words they get confused. They want to know when to use "TOO", "TWO", or "TO". Here again, programs we have developed or bought help them with these basic problems.

In addition to vocabulary skills, our students attain a firmer grasp on many usage rules and learn to master their application. Although we realize this use of the computer lacks the necessary verbalization which many feel is the way to develop standard usage, our students want to know the "proper" English before returning to the mainstream. Since many are not exposed to standard usage in their surroundings, they are anxious to learn the formal rules and master the standard usage patterns. The rules are presented on the computer through a concise script at the beginning of the paragraph. Then, after reading the script, the student begins his active interaction with the computer. These drills are usually presented in a yes/no or multiple choice format; some include the use of the light pen which is touched to a correct answer. A student who is having problems with subject-verb agreement, for example, can work on the computer tape designed especially for this problem. A sentence will

appear such as "Mary (is/are) a pretty girl." The students then type in their response, and are immediately shown whether they are right or wrong. We soon discover that these programs can be extended to virtually any facet of usage. We found them to be particularly successful with verb endings, contractions, and possessives. One of the reasons for this success is that our students do not find this drill work nearly as boring as writing on dittoes; therefore, they spend much more time improving their skills. The computer gives many more examples, more repetition, and immediate response. We have found the element of immediate response especially important to our students because it eliminates the need to unlearn incorrect responses due to the delayed return of written work.

We saw quickly that computerized programs can be helpful with skills which require rote memorization and drilling, but we were somewhat skeptical about the improvement of analytical tools and actual writing capabilities through use of the computer. But we have found that both of these skills can be improved by work in programs of this kind. Some of the programs ask students to analyze different aspects of the structure and the content of a paragraph. Our students often have trouble, for example, recognizing topic sentences and main ideas. The program that we use to help with this problem carries our students step-by-step through a paragraph. After reading a paragraph, students are first asked to choose the best topic sentence from a set of four or five. If their response is correct, the computer will acknowledge the correct response and go on to explain why it is correct. If their response is incorrect, the computer will list questions such as "Is this sentence general enough to apply to every sentence in the paragraph?" Seeing this logical reasoning on the screen helps the students learn to move through a sequence of reasoning in their own mind. Next, the students learn the different ways a topic sentence can be developed and then are asked to apply this knowledge.

In other programs the students may be asked to analyze the content of a paragraph. They are asked to select the main idea usually through yes/no questions and multiple choice questions. Whether the students are correct or incorrect, the computer responds with a reasonable explanation as to why this is or is not the main idea. In this way, the computer teaches the students how to discriminate between generalizations which encompass all of the specifics and those which do not. We realize that discussion and verbalization is a very effective way to teach students how to comprehend the main idea or theme of a piece of literature, but the advantage of the computer with our students, is that it works with them step-by-step and allows them to see reasoning in a clear and concrete form. This reasoning explains to students how they arrive at a correct answer or why the answer is incorrect, and then directs them toward the right answer with more questioning.

Using the same format, the computer leads the students through the skills required to write a paragraph. Ron Mehlen has developed a three-part program which teaches our students to write better paragraphs. In the first part, students actually develop the paragraphs. In the first part, students actually develop the paragraph by following guidelines which

help them write and then support their topic sentence. In the second part they are taught how to revise their paragraph. This is also done by questions which deal with the previous instructions. At this point, Ron's program suggests that they take their paper to the teacher. Here we realized that the computer is not the actual teacher of writing skills, but is instead an important extension of the teacher by reinforcing writing skills that have already been explained. The final part of the program is for the teacher. They can grade the paragraph on the basis of the criteria taught by the previous program.

We spoke with Ron about this sense of the future use of computers for writing papers. He felt that this could be done by using a print-out machine which would transfer what is typed into the computer onto paper. Then the students would give this to the teacher for grading. The real advantage of this type of writing is that the students would not become discouraged by the prospects of rewrites due to writing errors. With the computer, misspelled words, incorrect sentences, and even entire paragraphs can be deleted or rearranged with the push of a single button. This may inspire our students to correct even the smallest error because it is so simple.

Literature is another more sophisticated or advanced area of instruction where computers may be used to good advantage. There are various ways that our students are helped to better understand literature through the computer in conjunction with the teacher. First of all, a program can be used as a pre-test to see how much students know about a particular period, author, or genre which is a part of the target context of a piece of literature. For example, if we ask our students to read *Huckleberry Finn*, we want to know how much they know about this time period and such important aspects as slavery and Mark Twain's opinions about these issues. By giving them a pre-test we can know where students stand. The advantage of this type of test over a written test are that the teacher receives an immediate readout on the students' knowledge without having to grade a paper; moreover, it allows the students to immediately begin work filling the necessary gaps. This efficiency allows the teacher to spend more time with other students. After reading and discussing the literature, our students return to the computer to go over specific and important details about the literature. Some of this information that is covered on the programs deals with symbol, plot, theme, style, and character development. This interaction between student and computer by questions and answers heightens the student's awareness and understanding of these aspects. This can also be used as a pre-writing aid or in preparation for a final test. And even the final test can be given on the computer.

In the short time that we have been exposed to computers in language arts, we have been very impressed by their effectiveness with OEC students. We have also been very impressed by the enthusiasm shared by faculty and students. This enthusiasm has snowballed. When the subject of computers was first brought up at a faculty meeting the reaction was very skeptical. Many of the teachers felt the computers would not be put to use and therefore would be a waste of money; others

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THE LITTLE RED ELECTRONIC SCHOOLHOUSE

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In order for creative thinking and effective expression of it to occur, a favorable learning environment must exist. Following is a projected scenario of and justification for a research project that takes place in a carefully created learning environment — the Language Learning Center. The subjects are children with low verbal abilities identified by standard reading and language tests, who live in a geographically and culturally isolated area. The Language Learning Center incorporates the latest language technology available, particularly telecommunications and computers. Computers are at the heart of the Language Learning Center because they embody the qualities of all other media; audio and pictorial information combined with verbal language produce the integrated language that young people have learned through television, film, and now computer.

Distance is no barrier for electronic communications which obliterate time/space limitations. Small computer technology is now available to use in geographically isolated areas. The Language Learning Center of this research project is Alvin Toffler's "Electronic Cottage" at school. It is housed in a portable classroom so as to be easily and unobtrusively integrated into a rural school system. In it are microcomputers, calculators, microfiche readers, typewriters, tape recorders, cameras, projectors, televisions sets, and portable video recording equipment. A video dish collects satellite signals of all available cable, educational, and commercial television channels. Telephones make connections with people and computers everywhere. In short, the electronic Language Learning Center consists of all the equipment needed to receive and produce communications in the new media, and it contains a library of books, magazines, films, video tapes, audio tapes, and computer software to make it possible for students to learn whatever they wish to learn — language skills as well as information in any content areas. The learning materials are artistically created to have aesthetic appeal* and to include information at different levels of difficulty and detail so individuals can take from the program information at whatever depth they are capable of comprehending. Computer games initially engage the students in computer operation, teaching them skills of hand-eye coordination and assertiveness that underlie subsequent learning.

Teachers, who serve as learning facilitators, help the children learn to use the technology while they also stimulate, encourage, and guide their students in the pursuit of developing language skills by using language and language technology to learn about a subject they are interested in. In general, a language experience approach to learning is employed: all the electronic technology utilizes language in the broadened sense of the term — any symbol system including mathematics, visual arts, and verbal language — and learning in any content area takes place through

*See my article "Best of 79: Aesthetics as the Measure," *English Journal*, December, 1979, pp. 81-84.

these language experiences.

The language project begins at the opening of school and continues for the whole school year. Pretesting and posttesting are administered in the areas of imagistic and verbal creativity, reading, writing, and mathematics, as well as cognitive style tests and teacher interviews to ascertain which language learning modes are most suitable for each student's interest and ability. Rather than standardized objective tests for testing creative expression in written and visual forms, creative thought is measured in the expression itself — in the actual written, mathematical, or visual composition. Measurement is taken after a whole school year through ratings of students' creative products, with special attention to their preferred modes of creative expression.

The theory behind the project is this: intelligence in our culture is based on ability to use language, and intelligence as we define it is developed through language ability. Our culture no longer depends solely on printed verbal language — the traditional literacy skills of reading and writing — to create, record, and transmit information and knowledge. Therefore, an expanded view of language that incorporates the new electronic language technologies might be a more effective agent of intelligence by 20th-21st century standards than the traditional literacy skills in isolation.

The culture of the 20th-21st century has become an information culture. According to Alvin Toffler in the April 1981 issue of *Media and Methods*, commodities are no longer the most important products of a society. Instead, information has become more important. And the wonderful thing about information is that it can't be used up like commodities such as oil. The use and sharing of information only generate more information.

Young people who are isolated — geographically, or culturally, or both — could benefit immensely from sharing in this information culture. By having the new language technologies made available to them, they can quickly learn the language that is used now to conduct cultural affairs and, by so doing, they can more easily take positions in mainstream culture, both socially and economically. In the process, they also become more proficient in the traditional language/literacy skills of reading and writing.

In the Language Learning Center, the educational requirement is to learn language skills. The content area in which these skills are applied is suggested by the students, with the guidance of the teacher. This is the individualized component of the curriculum, which is important but not complete without group interaction. In the Language Learning Center, students also explore their ideas with each other, often through the basic linguistic experience of talking. Also, they form study groups for certain learning experiences, such as learning a foreign language like Swahili or Spanish.

Through foreign language learning, an important component of the Language Learning Center, students step outside their own language to become more objective, to learn the nature of language, and by so doing to become more intelligent users of their mother tongue. By learning

foreign languages, they also gain introductions to other cultures, and a similar kind of objective cultural learning takes place. Students overcome their cultural isolation to realize they are part of a multi-cultural world.

This research project operates with the view that traditional literacy is too narrow a concept, too limited, to be the sole basis of intelligence. An expanded view of language allows for the development of an expanded view of intelligence, which in the long run will produce more intelligent learners who are more proficient in the basic traditional literacy skills of reading, writing, and computation than their peers who are taught those skills in classrooms isolated from the language technologies that are now basic in our culture.

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felt that the computer simply could not be effective with the students. Most of the teachers were accustomed to their own patterns and routines and resented the idea of a computer altering their teaching techniques. One more venturesome teacher, however, suggested that somebody would use them and that the enthusiasm would pass on. And this is exactly what happened. What was discovered is that the computer does not take the place of teachers but, in fact, extends and enlarges the teachers' effectiveness by allowing them more time to spend with the students. As Ron Meilen put it, many of the teachers now feel that the computer and the teacher together are more effective than either could be alone. And we ourselves have not only caught this enthusiasm, but have even, in this short time, written our own programs.

MAKE ROOM FOR COMPUTERS IN LANGUAGE ARTS

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This essay is addressed to the English teacher who has never been closer to a computer than the supermarket checkout counter; to the teacher who no longer questions the presence of computers here on earth or in outer space; to the teacher who sees the emergence of this increasingly computer-dependent world and stops to ask: "What can I as a language arts teacher do to help prepare my students for this new technology?"

Alvin Toffler, author of *Future Shock* and *The Third Wave*, in a recent speech before the National Council of Teachers of English said, "Tomorrow's students who know nothing about computers will be one-third illiterate." However urgent the need to include computers in the curriculum may appear to an educator, the reality is that not all schools have computers or money budgeted for their purchase. In this situation a teacher still might ask, "What can I do?"

THE SCHOOL WITHOUT A COMPUTER

Some ideas a language arts teacher might consider which do not require a computer are to offer students:

1. a unit on the development of instruments used in writing and corresponding samples of period literature written with these instruments.
    a) the quill and calligraphic styles of hand-lettered texts
    b) pens, pencils, printing blocks
    c) early printing presses, the evolution of printing, typewriters, linotype
    d) computers, text editors, word processors
2. a unit on vocabulary to show language change or how simple words accrue new meanings, for example:

    the word "chip" from a standard definition of "a small, thin piece of wood, stone, metal, etc.," has in the past ten years gained an additional meaning: "a small rectangular piece inside a microcomputer containing integrated circuits which perform electrical functions."

    Beyond the definition, consider the impact of wood "chip" as it might appear in *Hansel and Gretel* and "chip" as a multi-million dollar industry which has revolutionized computer technology. Words which have taken on specialized meanings in technology abound: drive, memory, monitor, paddle,

program, etc.

3. a unit of acronyms to have students investigate the full spelling of organizational acronyms such as NASA, HUD, etc. or of things: RAM, ROM, DOS, etc. Are acronyms purposeful and useful or do they only confuse and contribute to language decay?

4. a course on technical writing.[1]

THE SCHOOL WITH ONE COMPUTER

A not uncommon situation is the school with one computer used exclusively by one department. Often, a computer resides in the math or science department because these departments were the first to become intrigued by the new technology. Sometimes, having met with little interest among their colleagues on the faculty these departments preempt the computer for their own use. The earliest lesson material was designed for math and science classes. Whatever the precedent, "tradition" when referring to computers has a short history. If your school does not have a person to coordinate computer use, and if computers are not to be purchased directly for the language arts department in the early 1980's, then perhaps it is time to convince the faculty that a computer resource is one which should be shared. Two approaches toward this end might be:

an indirect approach involving groundwork before the request is made.

Find out what kind of computer your school has, that is, the specific make and model. Write, visit or telephone the marketing representative of the machine to find out what kinds of "software" (the kinds of programs available) will run on the machine and their instructional or educational capabilities. Jargon should not be a deterrent. Most people who deal in computers are enthusiastic and pleased to enlighten anyone willing to listen. Some machines are more suitable for an educational market than others. If the computer in your school accommodates educational software, seek the vendor's help in locating programs for language arts. Get names and phone numbers of teachers who are using it. Software is not cheap. Request a demonstration or seek an endorsement from a user.

Software exchanges, computer clubs, and non-profit educational computing consortia are sources of information as are commercial publishers. Magazines such as *"Classroom Computer News", "Electronic Learning", "The Computing Teacher",*[2] provide reviews and listings of what is available and where to get it. If you are successful in acquiring a piece of software free or on loan which will run on the computer in your school, approach your principal, or your math or science colleague and ask for help in testing out the program. If the program has educational value for students, some means should be found for their using it. Even if you do not have the physical software in hand, the homework you do, combined with your interest, should strengthen your bargaining position.

the direct approach.

Many teachers report that computers are instrumental in breaking down barriers between departments. Consider the following scenario:

> The English teacher approaches the math teacher with an eagerness to be instructed in the use of the computer, that is, how to turn the machine on and off, how to put in or "load" the software, and to locate keys on the keyboard. After proper care and concern for the equipment is demonstrated, the English teacher is given permission to use the computer "now and then."
>
> The computer is moved to a language arts classroom of thirty students divided into three groups. One group of ten is at the computer. Five are seated in front of the computer taking turns at an educational game which is enjoyable and thus motivational. Five competitors stand behind and watch, awaiting their turn. As correct answers are entered, a space capsule moves across the screen which students try to capture with a series of 'laser shots'; the score depends on the amount of time taken to answer the problems.
>
> The rest of the students (the second and third groups) are at their desks. While waiting to go to the computer, they work on a writing assignment:
>
> > Group 2 records in the third person, present tense, the activity they are observing. After their turn at the computer, they can correct their written observations.
> >
> > Group 3 has the same assignment, but because they are the last team to work at the computer, they will not be able to correct their observations.
> >
> > Group 1, upon returning to their seats, records in the first person, past tense, what they did.
>
> Comparisons of what took place are discussed from three different points of view.

The educational game in the above scenario may or may not be within the usual concerns of the language arts classroom. Learning, however, takes place through describing an object and an activity which today's children relate to and which tomorrow's children will need to understand. The larger suggestion is that many programs developed for other disciplines might be used to advantage in a language arts classroom, provided their use is coordinated among interested teachers.

THE SCHOOL WITH MULTIPLE COMPUTERS

At present, computer applications for language arts lag behind those developed for other disciplines: mathematics, science, social studies, and business. One way to react to a less than abundant supply of good

software is to deplore the lack and do nothing. Such a complaint is not without justification, but, ironically, those who voice it most are not classroom teachers, but those most intimately involved with instructional software development. Developers are painfully aware of the high costs of producing just a single software package and that those packages which are educationally sound and imaginative require large amounts of time and talent. Typical estimates are a calendar year from the inception of an idea to the release of a final product at costs of from $10,000 to $20,000. Products may be slow to arrive on the market even though both private and commercial publishers[3] are at work to fill the gap.

Credible software, however, **does exist** for language arts, particularly drill and practice and tutorial types of applications. In addition, word processing packages are powerful tools to teach and to learn about language. Entering text into a word processor is similar to using a typewriter. But, should an author wish to revise, pressing a few keys to delete, move, or insert text accomplishes the task in seconds. Changed text can then be viewed on a CRT video display and a clean, polished copy delivered from a printer attached to the computer.

Instead of waiting for an abundant supply of ideal software, English teachers are encouraged to:

Explore what is available for language arts and begin to use it.

While there are more sophisticated techniques for evaluating software, a simple, common sense approach is:

1. Find out what the computer program is intended to do. Programs should have documentation or support materials which state the purpose and list the objectives.
2. Examine the software. That is, read the support materials and run the program. Do not look for all of the things you expect and criticize it for things it does not do. Examine software for how well it does what it is purported to do.
3. Ask yourself, "Will it work with my students?"

Deciding whether a program will work with students cannot be separated from the instructional strategy. In turn, these strategies for using computers are related to class size; the ratio of students to equipment; the type of program to be used; and whether the program is most effective in one-on-one situations, for small groups, by teams of students, or in demonstration for an entire class.

Three sets of programs developed for language arts by the Minnesota Educational Computing Consortium (MECC)[4] are described below.

MECC *English Volume 1* programs are a series of tutorials on the parts of speech intended for remediation and diagnostic quizes at the college level, or as supplemental drills for secondary students. Teachers can select from 154 sentences to pretest and posttest what students learn from their work on the computer.

MECC *Teacher Utility Volume 1* programs are a series of aids for teachers to create word puzzles and word games and generate "on-screen" reviews or paper copy tests. Teachers can type in the vocabulary they wish. Because of the teacher control, materials are applicable for most grade levels.

MECC *Special Needs Volume 1* programs are a series of spelling drills and tutorials using the Dolch word list. All words and sentences in the programs can be changed by the teacher. Grade levels are elementary to junior high.

The series of ideal textbooks to satisfy all teachers and all students does not exist, nor is there ideal software for all occasions. Software which is adaptable by teachers to serve varying needs of students, however, is one of the real strengths of computerized instruction.

Experiment with programs developed for other disciplines using a team approach.

Many programs exist for other disciplines which can augment the work of the language arts classroom or, conversely, programs such as the teacher utilities described above can teach the specialized vocabulary of a science or social studies unit. One use for an educational game has already been described. Another type of program to consider is the simulation. If you are of the persuasion that language arts teachers have the world for a marketplace, then do a part of your computer program shopping in social studies. Programs exist for role playing presidents, tactician and even fish (as part of a food chain in a crater lake). The epicenters of earthquakes and the waterways of voyageurs can be simulated, studied, and researched. Many simulations could be used in social studies for one set of activities and in language arts for another.

Become involved with development as a vocal consumer: as an evaluator; as part of a design team.

As a vocal consumer:

Take note of the request for evaluation form which often accompanies a software package. Review the package and let the producer know your findings. Producing instructional programs is a new, dynamic marriage of technology and education. Constructive criticism is taken seriously and often incorporated in revisions or new applications. Most helpful to a producer is how you used the program with students, how the students reacted, what you feel the students gained from use of the program and, of course, any modifications you would like to recommend. Consider sharing your review with other teachers in your district.

As an evaluator:

Many producers are appreciative of the offer of classrooms in which to pilot their programs. If you would like to classroom test computer materials, let the producers know.

As part of a design team:

If you have a computer in your school, the probability is high that there is someone, perhaps a student, who knows how to program. You do not need to know how to write computer code or "to program" in order to be involved in or influence the design of an instructional program. You should be familiar with or be willing to learn, what a computer is capable of doing. Write a simple interactive lesson sequence on paper which you would like to see executed by a computer and turn it over to the student programmer. Be prepared for problems. You may wish to share "the computer's problems" with your students. Begin to learn, teacher and students together, how a computer works.

Computers now are almost commonplace. Yet, their capacities seem to be ever expanding. They influence our everyday living; they influence our language. That computers influence our language, may be the most compelling reason for English teachers to be involved. English teachers care about language. To the degree that they are detached from this new technology, they will be unable to affect its direction in education.

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